

THE MINERAL INDUSTRY OF THE REPUBLIC OF KOREA

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Despite a sluggish global economy in 2002, the Republic of Korea's economy continued its recovery following the financial crisis of 1997. The growth rate of the gross domestic product (GDP) increased by 6.3% in 2002. Increased domestic consumption, the rebound in exports, and an increase in equipment investment were mainly responsible for the sharp increase of the GDP. In December 2002, consumer spending fell after the Government tightened regulations on household borrowing. A decline in wholesale and retail sales indicated that the economic growth in 2003 would be slower than that of 2002. Industrial production increased by 6.1%, of which the construction sector increased by 22.6%, the semiconductor sector, 21.8%; automobiles, 12.0%; machinery equipment, 7.4%; and base metals, 4.9%. Since the financial crisis, the country's largest conglomerates (chaebols) have reduced debt and cross shareholdings and improved corporate governance. They continued, however, to dominate the corporate environment; the top 30 accounted for about 50% of exports and 40% of manufacturing output (Bank of Korea, 2003b, p. 1-21; Korea National Statistical Office, 2003§¹).

During 2002, the Government continued to push financial reform and sold off some state-owned financial institutions. The Government enacted and revised financial legislation to strengthen the protection of consumers and investors. The revision of the Bank Act, the Specialized Credit Financial Business Act, and the Enforcement Decree were introduced. The ailing insurance companies, mutual saving banks, and credit unions were rehabilitated through sale and merger. Seoul Bank was finally sold to Hana Bank, and the Cheju Bank was merged into Shinhan Financial Group. The Government also discussed a takeover of Chohung Bank with Shinhan Financial Group. In 2002, the Government used 3.7 trillion won (\$3.0 billion) of public funds in financial institutions to repay deposits, recapitalizations, compensation for losses, and the purchase of nonperforming loans. Since 1998, about 28% of domestic financial institutions have been phased out through restructuring. The Government also raised the single-shareholder ceiling on the ownership of stock of a bank, including a bank holding company, to 10% from 4%. If the limit is exceeded, then a single shareholder could increase stocks by gaining the requisite approval from the Financial Supervisory Commission. The outstanding nonperforming loans of financial institutions dropped to 34.7 trillion won (\$27.5 billion). Corporate structure reform continued to proceed in 2002. The Government's new unified and comprehensive corporate insolvency law (Insolvency Act) will consolidate three existing insolvency-related acts (the Reorganization Act, the Composition Act, and the Bankruptcy Act) and was expected to be effective by July 2003 (Bank of Korea, 2003a, p. 36-52).

The Ministry of Finance and Economy proposed to reduce the corporate tax to the levels of Singapore (22%) and Hong Kong (16%) in the next couple of years. Korea's corporate tax rate was 15% for companies with annual taxable incomes below 100 million won and 27% for those with incomes at or above 100 million won. It aimed to promote capital investments by domestic companies and to encourage foreign multinational corporations to set up operations in Korea. The Government planned to submit the corporate tax bill to the National Assembly in 2003. The Ministry also planned to change the regulation to allow foreign companies in special economic zones (SEZs) to outsource employees freely from any operations. Under the 2002 regulations, Korean companies could outsource employees in only 26 Government-designated operations for a period of 2 years. To create a favorable environment for foreign investments, companies that invest \$50 million or more in SEZs will pay no corporate and income taxes for 7 years and will receive a 50% reduction for another 3 years (Korea Herald, 2002a§).

The Republic of Korea has limited mineral resources. The country requires imports of a variety of minerals to meet its increasing demand. Nearly 100% of the country's demand for such mineral resources as bituminous coal, copper, iron, lead, and zinc ores, fluorite, gypsum, magnesite, and phosphate was imported from other countries. The Korea Resources Corp. (a ministry-controlled company) planned to invest \$1.38 billion to secure the supply of mineral raw materials by investing in overseas mining projects by 2010 for six minerals on which the country depended on imports—coal, copper, lead/zinc, rare earths, and uranium (Mining Journal, 2003).

In 2002, Korea's total trade was recorded to be \$314.6 billion. Exports rose by 8% to \$162.5 billion, and imports increased by 7.8% to \$152.1 billion. Petroleum and raw materials accounted for about 55.4% of total imports, and metal products shared about 1% of total exports. The competition between China and Korea will become more intense over exports in the automobile parts, electronic, steel product, petrochemical, shipbuilding, and textile sectors in the next several years. China has increased its market shares of exports to Japan and the United States in the past several years. Because of huge investments and technology transfers from Japan and western countries, China has rapidly narrowed the gap with Korea on production technologies. Korean steel producers planned to restructure their production lines to produce high-value-added products to survive. Korean companies are expected to face fiercer competition from high-quality Japanese products and low-price Chinese products in the markets with industrialized countries in the future (Korea Herald, 2002b§).

In 2002, demand for downstream aluminum products such as sheet was strong. Sales by Alcan Taihan Aluminum Co., Choil Aluminum Co., Namsum Aluminum Co., and Seoul Light Steel Co., which are major aluminum sheet producers, increased by a total

¹References that include a section mark (§) are found in the Internet References Cited section.

of 27.7% (an increase 27.5% in domestic sales and 27.8% in exports) in 2002 compared with those of 2001. The high growth in sale of aluminum sheet in the domestic market was mainly attributed to increased demand from the construction sector. Although new housing starts remained slow, the building renovation, repair, and maintenance increased by 12% in 2002 and was expected to continue to increase during the next several years. The import of aluminum ingots increased by 16% from January through November because of higher demand from the automobile sector. China and Russia were major aluminum ingot suppliers to the Republic of Korea (Korea Metal Journal, 2003a§).

The copper market in Korea was active in 2002. After a year of decline, refined copper imports increased to about 420,000 metric tons (t). Imports of copper scrap also increased to about 200,000 t. Chile, which was the main supplier of refined copper, accounted for more than 50% of the total followed by Australia, the Philippines, and China. Exports of refined copper from China increased by more than 100% in 2002 compared with that of 2001. Because of increase domestic demand, exports of wrought copper decreased slightly. Korea consumed about 920,000 t of copper (Korea Metal Journal, 2003f§).

LG-Nikko Copper Inc., which accounted for more than 95% of the country's refined copper output, planned to produce 510,000 t of refined copper in 2002 but fell short of the target. The company planned to produce 520,000 t in 2003. LG International and Korea Resources Corp. agreed to invest \$10 million to acquire 26% of the shares of Lafayette Mining of Australia, which owned the Rapu Rapu copper and zinc project in the Philippines. LG has the exclusive offtake agreement for Rapu Rapu concentrates. The construction of a mine will begin in early 2003, and it will begin operation by mid-2004. The mine was designed to produce 14,000 t of zinc, 10,000 t of copper, 18.4 t of silver, and 1.6 t of gold. The mine has a total resource of 7.14 million metric tons (Mt) grade at an average of 1.23% copper, 2.05% zinc, 2.54 grams per metric ton (g/t) gold, and 27.37 g/t silver (Metal Bulletin, 2003).

The Silver Hill (Eunsan) gold and silver mine of Ivanhoe Mines Ltd. of Canada was put into commercial production in March 2002. The mine was designed to mine and mill 150 metric tons per day of ore and to produce 1.6 tons per year (t/yr) of gold and 3.7 t/yr of silver for 2 years. The estimated production costs for the underground operation was in the range of from \$125 to \$150 per ounces of gold, net of silver byproduct revenue. The company discovered another high gold and silver mineralization area (Seongsan project), which is 2.5 kilometers southeast of the Eunsan Mine (Ivanhoe Mines Ltd. 2002).

Korean crude steel production has grown each year of the past 4 years and had become the fifth largest crude-steel-producing country in the world behind China, Japan, the United States, and Russia. The output of carbon steel from electric-arc furnaces (EAF) increased by 7.6%, and the output from converters declined by 0.6% because of the renovation of Pohang Iron and Steel Co. Ltd.'s (POSCO) No. 1 blast furnace in Gwangyang. The Korea Iron and Steel Association reported that the domestic demand for steel was 56.88 Mt, which was an 8.7% increase compared with that of 2001. The increased demand was attributed to the automobile, construction, and shipbuilding sectors. The export of steel products decreased by 8.4% because of import restrictions in such overseas markets as China, the European Union, and the United States. Except for cold-rolled coil and tinplate, all other steel products posted an increase in output. The import of hot-rolled coils and semimanufactured products increased sharply from China and Japan. In 2002, Korea posted its first steel trade deficit since 1997. The deficit was mainly the result of a substantial increase in imports of scrap iron and other raw materials for producing steel products. Korea depended heavily on the importation of scrap iron to meet domestic EAF demands. Crude steel from EAF accounted for about 45% of the country's total output (Korea Metal Journal, 2003b§, d§).

Korean steel product producers were expected to face intense competition from imported products and took various measures to enhance their competitiveness by shutting down old facilities, selling idle assets, and renovating and installing equipment to improve productivity. In 2002, steel output capacity decreased by 1 Mt to 48.88 Mt; blast furnace accounted for 56.1% of total capacity, and EAFs, the balance. INI Steel closed Incheon No. 2 shape steel rolling line, and POSCO shut down its No. 2 shape steel rolling line. POSCO built a stainless steel mill and installed another hot-dip galvanizing line to meet the growing demand from the automobile sector. Y K Steel Co. (formerly Hanbo Steel) planned to invest \$40 million to expand its steelmaking and rolling capacity. Other steel producers were considering adding more value-added products to their production lines (Korea Metal Journal, 2003e§).

POSCO completed its 600,000-t/yr stainless steel mill in Pohang. The company had a total stainless steel output of capacity of 1.66 million metric tons per year (Mt/yr). In 2002, the sale of stainless steel products accounted for 16.3% of the company's total sales. POSCO expected that the sale of stainless steel products would increase to 18% in 2003 and 20% in 2004. It had sufficient supply of stainless steel coil for its plant in Korea and was capable of supplying semimanufacturing stainless steel products to its subsidiaries in China (POSCO, 2003§).

In 2002, POSCO decided to pull out from the joint-venture company, POSVEN, in Venezuela. The decision was based on the oversupply of hot-briquette iron and political uncertainty in that country. The local currency depreciated drastically in 2002, and the investment environment became so unstable. Production, which was in full operation in 2001, had been forced to shut down in August 2002 because of a labor strike. POSCO estimated that the total loss was about \$179 million. It intended to sell its shares to a foreign buyer to recoup its investment as much as possible (Korea Metal Journal, 2002b§).

POSCO decided to expand its investment in China. The company would invest a total of \$150 million in 2003 in its three plants—Dalian POSCO CFM Coat Steel, Shunde Pohang Coated Steel Co., and Zhangjiagang Pohang Stainless Steel Co.—to meet the demand from automobile parts suppliers and electric home appliance makers in China. It also signed an agreement with Qingdao Iron and Steel Group to establish a joint venture (Qingdao Pohang Stainless Steel Co.) to construct a 150,000-t/yr stainless steel cold-rolling facility in Qingdao, Shandong Province, China. POSCO would have an 80% equity in the joint venture. It believed that investing in the steel manufacturing sector was a way to beat the trade barrier in that country and to increase its profit margin. Other Korean steel producers, such as Union Steel Manufacturing and KIS Wire, also expanded their investments in China (Steel Times International, 2002).

Since Hanbo Corp. declared bankruptcy in 1997, the company has been seeking a buyer for its steel plants in Pusan and Tangjin. The company, finally, decided to sell its assets in parts. The Pusan plant, which had an output capacity of 1 Mt/yr, was sold to Yamato Kogyo Co. of Japan for 140 billion won (US\$120 million). The Pusan plant was renamed YK Steel. Yamato Kogyo planned to invest 30 billion won (US\$23.8 million) to upgrade production technology and the environmental friendly equipment. AK Capital of the United States acquired the Tangjin plant for \$377 million; the plant was about 75% complete and had two Corex 2000 units for iron production and EAF for steelmaking. The plant was designed to produce 3 Mt/yr of steel (Metal Bulletin, 2002).

INI Steel, the largest minimill producer in Korea, produced 7.39 Mt of steel in 2002, and the financial situation for the company has improved. The debt ratio was reduced to 129% at yearend 2002 from 159% at yearend 2001 through cost savings and selling off assets. The company planned to invest \$105 million to upgrade existing and new projects, to sell off \$190 million worth of assets, and to reduce the debt ratio to 107% in 2003. The company planned to produce about 4% less of steel products in 2003 (Korea Metal Journal, 2003c\$).

The stainless steel sector was the major nickel consumer in Korea. Owing to the completion of POSCO's Stainless Steel Making Plant III, the demand for nickel in the domestic market was expected to increase in 2003. Because domestic demand for nickel has exceeded supply, Korea has imported about 25,000 t/yr of nickel. In 2002, Korea imported 25,501 t of nickel, and the import volume was expected to increase in 2003 (Korea Metal Journal, 2003b\$).

The steel sector was a major consumer of zinc. Although domestic coated steel sheet production increased, the consumption of zinc in the sector declined. Owing to improved coating technology, the quantity of zinc attached on to zinc aluminum alloy sheet and galva-annealed sheet has decreased. In other sectors such as steel pipe and wire, the consumption of zinc has increased which has caused imports to increase. The imports that had the largest growth were those from North Korea; zinc ingots increased by 112.3% to 17,795 t from January through October 2002. This upward import trend resulted from the development of new shipment routes. Even though North Korea's zinc ingot is not of premium quality, the price is much lower than that from China and the Republic of Korea (Korea Metal Journal, 2002a\$).

Coal supplied about 20% of the total energy requirements. Most steam coal was imported because the country produced low-quality anthracite, which was used for home heating and small boilers; steam coal was mainly from Australia and China. The country relied on imported crude oil and natural gas to meet its fossil fuel demand. Hydrocarbons accounted for about 54% of the total energy consumption in Korea. The state-owned Korea Gas Corp. was responsible for importing liquefied natural gas (LNG) to supply to the state-owned Korea Electric and Power Corp. Import quantities have continued to grow in the past 2 years, and the demand for gas was projected to grow at a rate of 4.7% per year during the next 10 years. LNG was imported on a long-term contract basis from Brunei, Indonesia, Malaysia, Oman, and Qatar. Korea Gas planned to sign a long-term LNG supply contract with Australia LNG of Australia. The Australian company will supply 3.2 Mt of LNG to Korea during a 7-year period (Korea Herald, 2003\$).

References Cited

- Bank of Korea, 2003a, Current economic and financial movement: Seoul, Republic of Korea, Bank of Korea Quarterly Bulletin, March, 75 p.
- Bank of Korea, 2003b, General economic trends: Seoul, Republic of Korea, Bank of Korea Annual Report, 73 p.
- Ivanhoe Mines Ltd., 2002, Ivanhoe Mines' new Silver Hill gold and silver in South Korea begins commercial production: Vancouver, British Columbia, Canada, press release, August 7, 2p.
- Metal Bulletin, 2002, US executives will run restarted Hanbo Steel: Metal Bulletin, no. 8715, October 14, p. 3.
- Metal Bulletin, 2003, Korean investors back Rapu Rapu copper-zinc project: Metal Bulletin, no. 8743, January 27, p. 4.
- Mining Journal, 2003, Korea plans overseas minerals investment: Mining Journal, v. 340, no. 8727, p. 184.
- Steel Times International, 2002, Posco push China investment: Steel Times International, v. 26, no. 7/8, p. 11.

Internet References Cited

- Korea Herald, 2002a, Gov't drastically ease regulations for foreign-invested firms in SEZs, accessed August 20, 2002, at URL http://www.koreaherald.co.kr/SITE/data/html_dir/2002/08/21/2002/200208210016.asp.
- Korea Herald, 2002b, Korea facing threat from Chinese revals, accessed July 16, 2002, at URL http://www.koreaherald.co.kr/SITE/data/html_dir/2002/07/17/2002/200207170015.asp.
- Korea Herald, 2003, KOGS to import LNG from Australia, accessed March 10, 2003, at URL http://www.koreaherald.co.kr/SITE/data/html_dir/2003/03/08/200303080007.asp.
- Korea Metal Journal, 2002a (December 9), Imports of North Korean zinc ingot increase, accessed January 28, 2003, at URL http://www.kmj.co.kr/english/include/news_print.jsp?ddtcode=20021209181605.
- Korea Metal Journal, 2002b (November 21), POSCO to close joint venture project in Venezuela, accessed April 8, 2003, at URL http://www.kmj.co.kr/english/include/news_print.jsp?ddtcode=2002112184941.
- Korea Metal Journal, 2003a (January 23), Aluminum sheet sales sharply increase last year, accessed January 28, 2003, at URL http://www.kmj.co.kr/english/include/news_print.jsp?ddtcode=20030124185111.
- Korea Metal Journal, 2003b (May 5), Domestic demand for nickel expected to increase, accessed May 6, 2003, at URL http://www.kmj.co.kr/english/include/news_print.jsp?ddtcode=20030506144747.
- Korea Metal Journal, 2003c (February 3), INI Steel posts all-time highs in sales and profit last year, accessed April 8, 2003, at URL http://www.kmj.co.kr/english/include/news_print.jsp?ddtcode=20030203182622.
- Korea Metal Journal, 2003d (March 10), Korea relies 43.6% of imported steel from Japan, accessed April 8, 2003, at URL http://www.kmj.co.kr/english/include/news_print.jsp?ddtcode=20030310181653.
- Korea Metal Journal, 2003e (April 28), Steel industry looking to strengthen competitiveness for survival, accessed May 6, 2003, at URL http://www.kmj.co.kr/english/include/news_print.jsp?ddtcode=20030428182222.
- Korea Metal Journal, 2003f (February 6), Wrought copper alloy sales increase 9.8% in 2002, accessed March 10, 2003, at URL http://www.kmj.co.kr/english/include/news_print.jsp?ddtcode=20030207183947.

Korea National Statistical Office, 2003, The industrial activities in the first quarter and in March, accessed May 13, 2003, at URL
http://www.nso.go.kr/eng/releasees/e_sjcu0303.htm.

POSCO, 2003, POSCO completes stainless steel making plant III, a plant with an annual capacity of 600,000 tons, accessed May 13, 2003, at URL
http://www.posco.co.kr/en/press/releases_view.jsp.

Major Sources of Information

Korea Institute of Geology, Mining, and Materials
30, Kajungdong, Yusongku
Taejon, Republic of Korea
Ministry of Trade, Industry, and Energy
1, Chungang-dong, Kwach on, Kyonggi
Seoul, Republic of Korea

Major Publications

Statistics of Korea. Economic Planning Board, monthly.
Yearbook of Energy Statistics. Korea Energy Economic Institute.
Steel Statistical Yearbook. Korea Iron and Steel Association.

TABLE 1
REPUBLIC OF KOREA: PRODUCTION OF MINERAL COMMODITIES¹

(Metric tons unless otherwise specified)

Commodity	1998	1999	2000	2001	2002
METALS					
Bismuth, metal	117	108	71	106	69
Cadmium, smelter	1,178	1,791	1,911	1,879	1,827
Copper:					
Mine output, Cu content	41	--	--	--	--
Metal:					
Smelter ^e	293,000	370,000	410,000	410,000	410,000
Refined, primary and secondary	373,305	450,444	467,900	473,624	494,561
Gold, metal kilograms	22,822	25,730	22,605	28,595	26,181
Iron and steel:					
Iron ore and concentrate:					
Gross weight thousand tons	486	410	336	195	157
Fe content do.	272	230	188	109	88
Metal:					
Pig iron do.	23,092	23,329	24,938	25,898	26,570
Ferroatloys:					
Ferromanganese	158,418	140,208	146,373	143,525	137,000
Ferrosilicomanganese	106,997	116,091	103,522	101,877	94,000
Other	2,785	4,639	4,676	4,452	--
Total	268,200	260,938	254,571	249,854	231,000
Steel, crude thousand tons	39,896	41,042	43,107	43,852	45,390
Lead:					
Mine output, Pb content	3,558	1,822	2,724	988	28
Metal, smelter	133,066	143,583	170,704	161,000	178,722
Nickel	20,183	20,235	29,890	26,429 ^r	30,337
Silver, metal kilograms	339,442	488,792	591,130	664,533	973,140
Zinc:					
Mine output, Zn content	10,488	9,832	11,474	5,129	99
Metal, primary	390,260	429,766	473,897	503,315 ^r	600,027
INDUSTRIAL MINERALS					
Barite	--	--	30	--	--
Cement, hydraulic thousand tons	46,791	48,579	51,424	52,046 ^r	55,514
Clays, kaolin do.	2,260	1,858	2,098	2,384	2,831
Diatomaceous earth	37,649	30,222	34,143	27,530	20,666
Feldspar	248,493	409,334	330,417	389,361	415,580
Graphite, all types	62	62	65	65	94
Mica, all grades	38,459	24,733	65,249	109,339	29,870
Nitrogen, N content of ammonia	496,000	489,000	369,000	368,000	153,000
Salt ^e	770,000	750,000	800,000	800,000	800,000
Soda ash, manufactured ^e	300,000	310,000	310,000	310,000	310,000
Stone, sand and gravel:					
Limestone thousand tons	69,871	74,061	77,868	79,521	83,767
Quartzite do.	1,821	2,160	2,321	2,377	3,041
Sand, including glass sand do.	1,257	1,306	879	900	891
Sulfur, byproduct: ^e					
Metallurgy do.	476	528	572	665	680
Petroleum do.	600	600	600	600	610
Total do.	1,080	1,130	1,170	1,270	1,290
Talc and related materials:					
Pyrophyllite	843,609	754,657	917,973	1,101,825	889,961
Talc	24,411	15,313	11,344	47,712	37,863
MINERAL FUELS AND RELATED MATERIALS					
Carbon black	384,318	438,128	454,699	438,128	440,000 ^e
Coal, anthracite thousand tons	4,356	4,197	4,174	3,817	3,318
Fuel briquets, anthracite briquets ^e	12,500	13,000	13,000	13,000	13,000
Petroleum refinery products thousand 42-gallon barrels	851,447	897,373	911,761	930,000 ^e	940,000 ^e

^eEstimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. ^rRevised. -- Zero.

¹Table includes data available through August 1, 2003.

TABLE 2
REPUBLIC OF KOREA: STRUCTURE OF THE MINERAL INDUSTRY IN 2002

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Bismuth, metal	metric tons	Korea Tungsten Mining Co. Ltd.	Sangdong	135
Cement		Ssangyong Cement Industrial Co. Ltd.	Plants at Chandong, Kwang Yang, Mungyong, Pukpyong, and Yongwol	17,900
Do.		Sung Shin Cement Manufacturing Co. Ltd.	Tanyang plant	13,700
Do.		Tong Yang Major Corp.	Plants at Pukpyong and Samchok	12,600
Do.		Lafarge Halla Cement Corp.	Plants at Kwang Yang and Okkye	9,500
Do.		Hyundai Cement Co. Ltd.	Plants at Tanyang and Yongwol	8,600
Do.		Hanil Cement Manufacturing Co.	Plants at Chungbuk and Tanyang	7,900
Do.		Asia Cement Manufacturing Co. Ltd.	Plants at Daegu and Jaechon	4,600
Copper, metal, primary		LG-Nikko Copper Inc.	Changhang	60
Do.		do.	Onsan	460
Graphite		Kaerion Graphite Ltd.	Kangwon	NA
Do.		Wolmyong Mining Co.	do.	NA
Gold, in concentrate	kilograms	Ivanhoe Mines Ltd.	Haenam, Cholla Province	1,600
Lead, metal, primary		Korea Zinc Co. Ltd.	Onsan	200
Nickel, metal		Korea Nickel Corp.	do.	51
Steel, crude		Pohang Iron and Steel Co. Ltd.	Kwangyang plant	15,000
Do.		do.	Pohang plant	13,000
Do.		INI Steel Co.	Donggu plant	4,750
Do.		do.	Pohang plant	3,140
Do.		Dongkuk Steel Mill Co. Ltd.	Inchon Works	1,450
Do.		do.	Pohang Works	3,600
Do.		Kia Steel Co. Ltd.	Kunsan	720
Silver, in concentrate	kilograms	Ivanhoe Mines Ltd.	Haenam, Cholla Province	3,700
Talc		Dongyang Talc Mining Co.	Chungju Mine	NA
Zinc, metal, primary		Korea Zinc Co. Ltd.	Onsan	400
Do.		Young Poong Corp.	Sukpo	200

NA Not available.